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BIOLOGICAL EVALUATION OF A PINE SAWFLY INFESTATION IN THE LEWIS AND CLARK NATIONAL FOREST, MONTANA

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Missoula, Montana

BIOLOGICAL EVALUATION OF A PINE SAWFLY INFESTATION IN THE LEWIS AND CLARK NATIONAL FOREST, MONTANA, May 1961

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INTRODUCTION

Sawflies may again severely defoliate about 6,000 acres of ponderosa and lodgepole pine trees within the Little Rockies division of the Lewis and Clark National Forest, Montana during 1961. Two species of sawflies, identified as Neodiprion nanulus contortae and N. fulviceps complex, are involved. The infestation has been active in the Little Rockies for the past five years or more. Damage on host trees became very obvious in 1959 and was reported by M. F. Phillips, staffman, Lewis and Clark National Forest.

A major forest fire that swept through the entire Little Rockies region about 1936 consumed most of the trees, but left islands of ponderosa and lodgepole pines on ridge tops and in some unburned ravines. These islands seem to be nuclei for current sawfly infestations, especially when they occur on dry, open, south- and east-facing ridges and slopes.

The significance of the infestation was first evaluated on June 23, 1960 by entomologists from the Missoula Forest Insect Laboratory. A subsequent report 1/ described the sawflies' feeding habits, characteristics of the infestation, and a tentative life-cycle for the insects in this particular area. The possibility of tree mortality developing from the infestation was also discussed.

1/ Tunnock, A. 1960. Evaluation of a sawfly infestation in the Lewis and Clark National Forest, Montana in June 1960. Unpublished report of the Forest Insect Laboratory, Intermountain Forest and Range Experiment Station, Forest Service, U.S.D.A., Missoula, Montana. (Processed)

METHODS

A further biological evaluation was made of the infestation within six areas outlined in figure 1 from May 16-23 of this year. The survey procedure used was developed by Kapler and Benjamin[2/]. Although this procedure was designed to evaluate populations of the red pine sawfly (N. nanulus nanulus Schedl.), it was considered applicable to the sawfly problem in the Little Rockies. The red pine sawfly's life-cycle, feeding habits, and egg laying habits are similar to those of the species involved.

The average number of twigs per area, bearing sawfly eggs inserted into current season needles, was used to classify the infestation.

Sampling procedures used in May 1961 were based on plots located at random within infested stands. The size of the infested areas determined the number of plots needed therein. In the Little Rockies there were six areas over 100 acres in size and the need for 20 plots per area was indicated.

Heights of trees to be examined and stand density influenced the procedure employed on each plot. Three different stand classifications appeared germane to this survey and the methods used for each are outlined below:

1. Density varied, trees under 15 feet in height

    1. Selected at random, 10 trees per plot that showed evidence of sawfly defoliation in 1960.

    2. Current foliage of 1 twig from 5 different branches near mid-crown of each tree as sampled.

    3. The number of sample twigs bearing sawfly eggs on each tree was recorded.

    4. The number of twigs bearing eggs from sample trees on the plot was totalled.

2/ Kapler, J. E. and D. M. Benjamin. 1961. Red-pine sawfly survey procedure. Cooperative Economic Insect Report, Agr. Research Serv., U.S. Dep. Agr. 11(13): 235-239. (Processed)

II. Open stand, trees over 15 feet in height.

1. Selected at random, 10 trees per plot that showed evidence of sawfly defoliation in 1960.

2. A pole pruner was needed to cut the twigs described in 1.

3. The number of sample twigs bearing sawfly eggs on each tree was recorded.

4. The number of twigs bearing eggs from sample trees on the plot was totalled.

III. Closed stand, trees over 15 feet in height

1. Selected at random 5 trees per plot that showed evidence of sawfly defoliation in 1960.

2. A pole pruner was used to cut 1 twig with current foliage from 10 different branches near the mid-crown of each sample tree.

3. The number of sample twigs bearing sawfly eggs on each tree was recorded.

4. The number of twigs bearing eggs from sample trees on the plot was totalled.

The twenty plots in each survey area were selected so that most heavily defoliated spots scattered throughout infested areas outlined in figure 1 would be sampled. Lodgepole and ponderosa pine twigs that bore sawfly eggs were collected from each infested area and brought back to the Laboratory for rearing and egg viability determination.

The severity of the infestations in the six areas was classified by employing the following standards:

Average number of egg-bearing twigs per infested area 1/	Infestation severity	Predicted defoliation of old foliage in 1961 (Percent)
0 to 9	Light	0 to ·25
10 to 19	Medium	25 to 50
20 or more	Heavy	50 to 100

1/ Sample unit: 1,000 twigs per area

RESULTS

Portions of areas 1 and 3 (fig. 1) are expected to be the most heavily infested in 1961, and from 50 to 100 percent of the 1960 foliage, all that remains on some trees, may be consumed. Infestations in areas 2, 4, 5, and 6 were classified as medium. Trees in these areas may lose up to 50 percent of their old foliage (table 1).

Altogether, 6,000 twigs from ponderosa and lodgepole pine trees were sampled for eggs in the six areas. Thirty-three percent of them contained eggs. Ponderosa pine tree twigs were more heavily infested with eggs than lodgepole pine twigs, 45 percent compared to 29 percent, respectively (table 2).

Evaluation results, based on data in tables 1 and 2 and field observations, will be discussed below for each infestation area.

Area 1.

This area contains a heavy population of overwintering sawfly eggs, especially on overstory ponderosa pine trees. Six slopes facing south or east have large patches of pines under 15 feet in height that have been heavily defoliated. Thirty-four percent of the egg-bearing twigs came from lodgepole pines sampled in these patches. Some large lodgepole pine trees on south-facing slopes have been killed in past years.

Area 2.

Supports a medium sawfly egg population, with overstory ponderosa pines in open stands having the most eggs. Three ridges running east to west grow large stands of lodgepole saplings that are heavily defoliated from larval feeding in 1960 or before. Some mortality might occur of ponderosa pine trees that only have 1960 foliage left.

Area 3.

The heaviest sawfly egg population and the most tree mortality from past years occur in this area. Groups of overstory trees are predominantly lodgepole pine. Some large ponderosa pines are in these groups, and a few pure stands of ponderosa pine grow in several ravines. Ponderosa pines supported the greatest percentage of egg-bearing twigs, but the percentage of lodgepole pine twigs bearing eggs was higher in this area than in the other five. Over 50 percent of the twigs examined in area 3 contained eggs.

If the predicted 50 to 100 percent defoliation of the 1960 foliage occurs here in 1961, many trees that are on the threshold of death may perish this year.

Table 1.--Number of pine tree twigs containing sawfly eggs; from 50-twig samples on plots located within infested areas[1/]

Plot No.	Infestation areas					
	1	2	3	4	5	6
1	40	12	31	4	3	12
2	24	9	22	2	21	14
3	18	0	15	3	19	23
4	28	9	29	4	11	8
5	16	12	39	5	5	15
6	18	4	42	21	17	9
7	31	20	35	14	7	4
8	12	30	37	10	10	20
9	30	30	22	12	3	3
10	33	15	18	20	12	10
11	30	20	6	14	18	8
12	32	20	14	7	11	11
13	22	33	27	28	4	16
14	23	3	15	14	1	15
15	31	7	12	4	2	23
16	8	23	34	4	2	23
17	9	9	43	10	22	25
18	12	10	14	8	21	4
19	6	1	41	14	31	14
20	36	6	14	4	12	41
Totals	459	273	510	204	236	288
Ave.	23	14	25	10	12	14
Infestation classification	Heavy	Medium	Heavy	Medium	Medium	Medium
Predicted defoliation	50-100%	25-50%	50-100%	25-50%	25-50%	25-50%

1/ Five twigs sampled from 10 trees on each plot.

Table 2.--Percentages of ponderosa and lodgepole pine tree twigs containing sawfly eggs in the needles

Infestation area	Number of twigs sampled[1/]		Stand density						All twigs sampled[2/]
			Open or closed, trees under 15 ft.		Open, trees over 15 ft.		Closed, trees over 15 ft.		
	PP	LPP	PP	LPP	PP	LPP	PP	LPP	
1	525	475	3.8	34.5	50.5	2.1			45.9
2	690	310	4.3	13.2	28.4	1.9			27.3
3	150	850		5.4	68.0	36.8		1.6	51.0
4	170	830	2.9	0.4	22.9	15.7		3.2	20.4
5	295	705	1.7	5.7	51.5	5.5			23.6
6	605	395	0.7	18.2	33.2	2.8			28.8
Totals	2,435	3,565							
Averages	406	594	2.2	12.9	42.4	10.8		.8	32.8

1/ Five twigs per tree.

2/ Percentage of egg-bearing twigs in the 1,000 twigs sampled in each infestation area.

Area 4.

A medium egg population exists, and defoliated overstory trees form a horseshoe-shaped pattern in this area. Over three-fourths of these trees are pole-size lodgepole pines. Again, the greatest percentage of egg-bearing twigs were on overstory ponderosa pine trees. Some overstory and sapling lodgepole pines have died because of repeated defoliation in previous years.

Area 5.

This area contains a medium population of sawfly eggs. The female sawflies that deposited these eggs apparently preferred overstory ponderosa and lodgepole pine trees growing on south slopes and open ridges. One large stand of lodgepole pine saplings was already very heavily defoliated. Although twice as many lodgepole pine twigs were examined for eggs, the greatest number of twigs bearing eggs were detected on overstory ponderosa pine trees. Many lodgepole pine trees on south slopes are already dead or dying from sawfly feeding. Several overstory ponderosa pines were noticed that are almost dead, and many may die on the drier sites if defoliation continues for one or two more years.

Area 6.

In this, the largest infested area, the sawfly egg population was classified as medium. Stringers of mature ponderosa pine trees were found along most ridge tops and in numerous ravines. Overstory lodgepole pines were rather scarce, but they could be found mixed with ponderosa pine trees. Vast acres of lodgepole pine saplings grew on the slopes. About one-third more ponderosa pine twigs were sampled for eggs than were lodgepole pine twigs. Thirty-four percent of the ponderosa pine twigs contained eggs. Four stands of lodgepole pine saplings, on south and east slopes, were severely defoliated. Numerous mature ponderosa pines appear to be on the verge of dying in the western part of Area 6.

Larvae began to emerge from eggs by June 5 on twigs stored in the Laboratory. An average of 97 percent of the eggs examined from ponderosa pine twigs were viable, and an average of 88 percent of the eggs on lodgepole pine twigs were viable.

DISCUSSION

Additional killing of ponderosa and lodgepole pine overstory trees, and of lodgepole pine saplings in plantations, may occur within currently infested areas during 1961. This is very probable, because 92 percent of the sawfly eggs examined appeared viable in May.

Artificial control measures have never been applied against sawfly pests of forest trees in Montana or northern Idaho because of the usual short life of the infestations and inconsequential damage to infested trees. Furthermore, most of the infestations have been in forests of western larch, a deciduous conifer species that apparently withstands considerable defoliation with comparative immunity.

Inasmuch as the present sawfly outbreak threatens to continue unabated in some ponderosa and lodgepole pine forests already heavily damaged from it, artificial control may have to be resorted to. Outbreaks of closely related sawflies have been successfully controlled in the Lake and Southern States by the aerial application of DDT insecticide. There is some indication that similar treatment might be applied in the Little Rockies area if it was deemed justifiable from an economic standpoint.

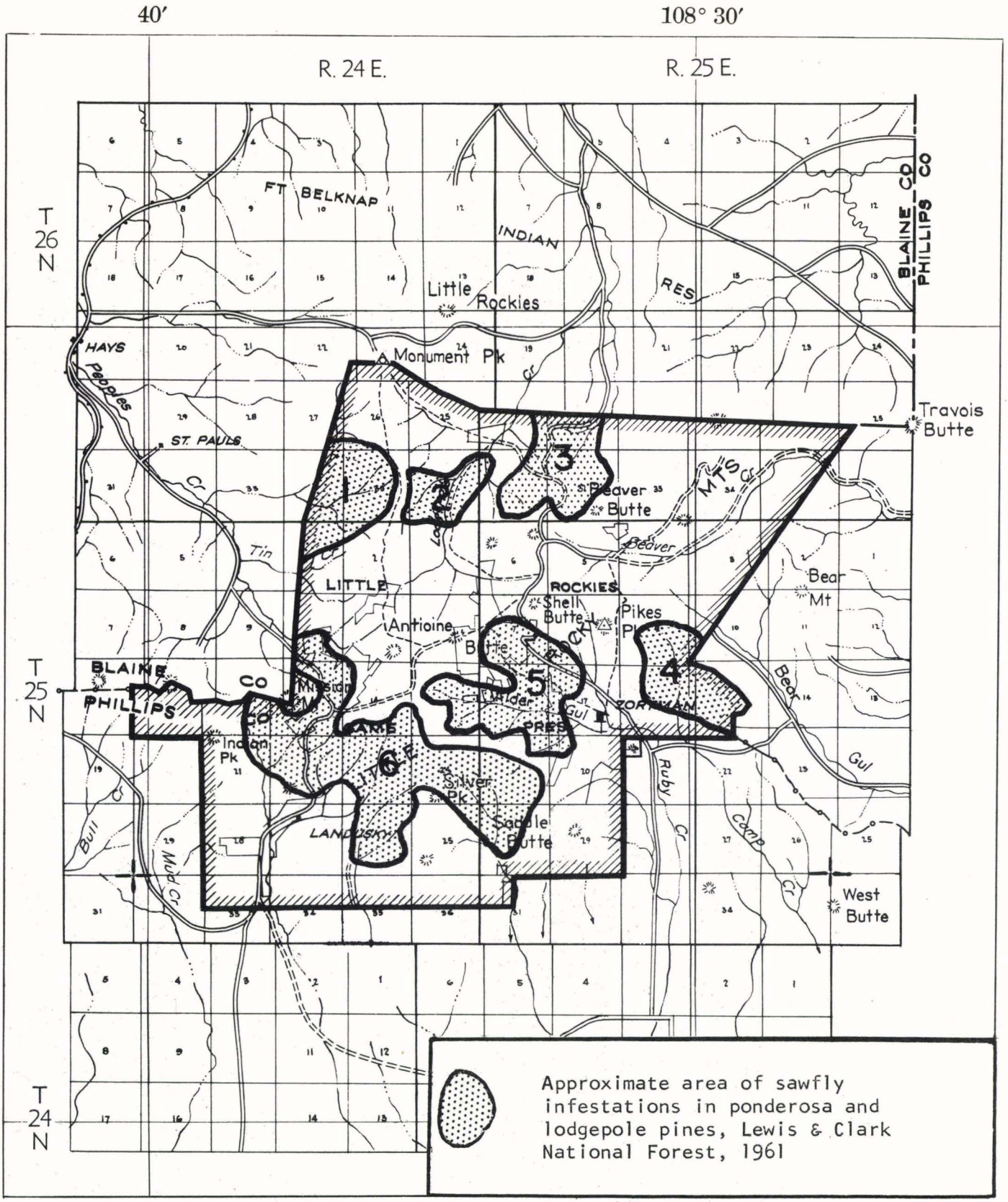

Figure 1.--Sawfly infested areas of ponderosa and lodgepole pines in the Little Rocky Mountains, Lewis and Clark National Forest, Montana.